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Orthopedic surgical scoring in asymptomatic COVID-19 patients

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Abstract
Aim: The purpose of this study is to create a scoring system to decide which patient will take maximum precautions while the covid 19 disease continues. Taking maximum precautions is not always possible in all surgical procedures. Therefore, surgical scoring in asymptomatic patients, selecting patients who need maximum precautions, and taking the necessary precautions for these patients will prevent unnecessary use of the equipment.
Material and Method: A total of 347 who were surgically treated for emergency or elective procedures between March 11 and November 11, 2020 were included in the study. Of these patients, 277 patients whose data could be accessed were included in the study. A scoring system has been created. Patients were divided into 2 groups: bearing low and high risk. Patients with a score above 10 were identified as having a high surgical risk, and those with a score below 10 were identified as having a low surgical risk.
Results: There were 132 patients in Group 1 and 145 patients in Group 2. It was observed that 29 of 277 patients became positive within the first month. Two of these patients were in Group 1 and 27 of them were in Group 2. It was observed that COVID-19 antibody or PCR tests gave more positive results in patients in Group 2 in the first month compared to two patients in Group 1. The highest positivity rate in Group 2 was observed in the arthroscopy group.
Discussion: Advanced precautions should be taken in patients with high surgical risk scores. In patients with low surgical risk scores, less strict precautions can be taken.

Keywords
COVID-19, Surgical Score, Surgical Risk

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Introduction

Although our experiences with Sars-CoV2 (COVID-19) disease, which was declared a pandemic on 11 March 2020, are progressively increasing, problems with the diagnosis still continue. Surgery of asymptomatic patients, known as supercarriers, poses a risk for us, surgeons, and operating room staff as well as to other cases taken to the operating room. In addition, surgeries performed during the incubation period of the disease and negative tests and findings increase the risk of infection of healthcare staff. Under these circumstances, it is essential to protect the surgical team. However, it is not clear whether the same precautions should be taken for all patients undergoing surgery.

Although developments in the treatment of the new type of coronavirus continue, an effective treatment method has not yet been found. Vaccination-related developments are promising and although some vaccines have completed Phase 3, it is obvious that it will not be sufficient to allow us to terminate the measures. Although vaccination studies continue, there is no doubt that it will take some time for vaccination programs to be put into use all over the world due to factors such as adequate health equipment and time. Information about the recently identified mutant virus such as omicron has increased and there is a common opinion that its infectiousness is high.

Personal protective equipment has been defined for all suspicious surgical procedures, which are determined by the World Health Organization and the Ministry of Health in our country. However, it is not possible to reach a sufficient amount of equipment everywhere, and unfortunately, it is not possible to use all this equipment in every patient regularly. To this end, grouping of patients by creating a surgical scoring and performing surgeries by taking higher safety measures in patients with a high surgical score will ensure that all surgeries are performed more safely.

Material and Methods

A total of 347 patients who were surgically treated for emergency or elective procedures between March 11 and November 11, 2020 were included in the study. Patient data were accessed using the hospital automation system. A total of 277 patients whose follow-up data were available were included in the study. COVID-19-positive patients who were taken to emergency surgery were not included in the study. Data such as age and gender of these patients, the reason for the surgery, comorbid diseases, duration of hospitalization, date of the surgery, blood parameters, postoperative COVID-19 antibody Ig M or Ig G test or Pcr test positivity obtained from the hospital automation system when they visit hospital for checkup in the first month postoperatively. In addition, the surgery notes of the patient were examined, and it was recorded whether there were any intraoperative complications, the amount of intraoperative bleeding, the type of anesthesia, and whether they were treated in a positive or negative pressure room. Their complete blood count, Crp, LDH, D-Dimer results were recorded as blood parameters.

The patients were divided into 2 groups and the surgery time, surgical procedure, type of anesthesia, intraoperative complication, expected bleeding amount, operating room feature, neutrophilia, lymphopenia, thrombocytopenia, Crp, Ldh, D-Dimer levels were evaluated by evaluating 1 point. Surgical score was established by giving 2 points to the patients in the high surgical group (Table 1). According to this table, patients who scored less than 10 points in total were named as low surgical risk, and patients who scored above 10 points as high surgical risk. Rapid antibody test (for S and N antigens) was used for preoperative diagnosis of Covid -19 disease between March and June 2020 in our hospital, and a viral PCR test was used as of June.

The results were evaluated with the SPSS 22 program. Comparisons between groups were carried out by Pearson's chi-square test.

Approval for our study was obtained from the Ministry of Health with the registration number 2020-12-04T14_53_09.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

One hundred and sixty-one patients were male and 116 of them were female. The mean age was 42.8 years. In Group 1, there were a total of 132 patients, 87 men and 45 women. In Group 2, there were 145 patients, 74 men and 71 women. The reasons for surgery and their positivity in terms of COVID-19 in Groups 1 and 2 are shown in Table 2. COVID-19 PCR or antibody positivity was detected in 29 of 277 patients within the first 1 month postoperatively. It was seen that 27 of these patients were in Group 2 and only 2 of these patients were in Group 1. Eleven were men and 16 were women among the patients who

Table 1. COVID-19 surgical risk score

SCORE		
	1	2
Surgery time	≤2 hours	> 2 hours
Surgical procedure	· Ingrown nails	· Spine surgery
	· Ganglion cyst	· Arthroplasty
	· Carpal tunnel syndrome	· Arthroscopic surgeries
	· Trigger finger	· Intramedullary nailing
	· Trauma surgery (excluding intramedullary nailing)	· Deformity surgery
		· Major joint and bone amputations
	· Closed reductions under anesthesia	
	· Musculoskeletal superficial infections	
Type of anesthesia	Local	General
	Regional	
Operation room conditions	Positive pressure	Negative pressure
Intraoperative complication	No	Yes
Expected bleeding	≤400ml	>400ml
Biochemical parameters*	No	Yes
· Neutrophilia (3500/mm^3)		
· Lymphopenia (1500/mm^3)		
· Thrombocytopenia (150.000/mm^3)		
· Crp (> 10 mg/liter)		
· LDH (250 u/liter)		
· D-Dimer (> 0.5 mg/liter)		

Low risk ≤10, 10< High risk; *Two or more parameters of positivity

Table 2. Surgeries and the number of patients in Group 1 and Group 2 and the number of patients who were COVID-19 positive in postoperative follow-up

	Hand surgery (including hand fractures)	Upper extremity trauma surgery	Arthroscopic procedures	Oncological surgeries	Arthroplasty	Lower extremity trauma, pelvis surgery and tendon injuries	Musculoskeletal infections and amputations	Deformity surgery (hallux valgus, hammer toe)	Spine surgery	Other orthopedic surgeries (nail ingrown, hip AVN, bursitis, foreign body removal, arthrodesis, scar revision)	Total
Group 1	49	33		12		10	8	1	3	16	132
COVID-19 positive patients (%)		2 (6%)									2(1.5%)
Group 2		3	67	18	27	9	2	9	10		145
COVID-19 positive patients (%)			17 (25.3%)	2 (11.1%)	6 (22.2%)				2 (20%)		27 (18.6%)

Table 3. COVID-19 positive cases in arthroscopic procedures

	Knee arthroscopy (meniscus repair, meniscectomy, anterior cruciate ligament reconstruction, anterior cruciate ligament revision surgery)	Shoulder arthroscopy	Hip arthroscopy	Ankle arthroscopy	Total
Number of patients	33	31	1	2	67
COVID-19 positive (%)	6 (18.1%)	9 (29%)	1 (100%)	1 (50%)	17 (25.3%)

tested positive in Group 2. When the distribution of 29 patients by month was examined, it was observed that positive results were more common in June, August and September. When 2 patients in Group 1 were examined, it was found that 1 patient tested positive in August and 1 patient resulted positive in October. When the reasons for the surgery were examined in these patients, it was found out that 1 patient was operated for the end fracture of the proximal humerus and 1 patient was operated for the humerus shaft fracture.

When the positivity rates of both groups for COVID-19 in the first month were compared, it was observed that the positivity rate was higher in Group 2 and there was a significant difference between the groups ($p<0.05$).

When the reasons for the surgery were examined in Group 2, it was seen that COVID-19 positivity was detected mostly after arthroscopic procedures (25.3%) (Table 3). This result was not statistically significant ($p>0.05$). When arthroscopic procedures were examined, it is seen that positivity was mostly detected after shoulder arthroscopy (29%). This result was not statistically significant either ($p>0.05$).

Discussion

Six types of coronaviruses (229E, OC43, NL63, HKU1, SARS-CoV, MERS-CoV) are known to be capable of causing disease in humans.[1] A new type of virus that emerged in Wuhan, China, in December 2019 was identified. Then, it was referred to as Sars-Cov-2 by the International Virus Taxonomy Committee. The disease caused by this virus was specified as COVID-19 disease by World Health Organization [2, 3].

As is known, this virus was found to be first transmitted from wild animals to humans in Wuhan, China, and then the virus showed its effects worldwide through human-to-human transmission [4, 5]. The disease is primarily transmitted through droplets. It is also known to be transmitted directly through the mucosa. In experimental studies, its infectivity was demonstrated to last for 3 hours in aerosols formed. Additionally, transmission depends on the time of contact with the virus carrier, the manner of contact, the application of protective measures, the virus load in the infected secretions and the incubation period. Moreover, there are studies evidencing that the virus can be easily transmitted in closed environments. Another important point to keep in mind in the transmission is environmental contamination. A study in Singapore demonstrated that coronavirus RNA was identified in samples collected from surfaces in a room where a COVID-19 patient was staying [6-10]. Furthermore, there is a common opinion indicating that the infectious rate of the new mutant virus is high.

Even though there are various procedures in the literature regarding what to pay attention to when various interventional procedures are performed for almost all branches, it is obvious that routine application is not possible for every patient. For this purpose, we think that it would be appropriate to perform surgical scoring on patients undergoing surgery and determine a risk scale after scoring and increase the measures accordingly. While making this scoring, we selected parameters in which the probability of transmission will increase by contacting the patient. The first one of these parameters is the surgical time. As it is known, the most important way of transmission of COVID-19 disease is by droplets. [11] The amount of time spent in close proximity to the patient increases with increasing surgery time, which also increases the risk of transmission. Another parameter is the number of people involved in the surgery. In addition, we think that surgical procedures increase the probability of transmission of the disease. For example, while the risk of contamination is low in short surgeries where there is less bleeding, in surgical procedures where there is more use of cautery and the amount of bleeding might be greater, and surgical procedures with drills, reamers, cutters where the amount of aerosol increases as well as arthroscopic surgeries and long-term surgeries will cause a great increase in terms of transmission risk due to the increased amount of droplet contact and aerosol [12, 13]. Again, in patients undergoing general anesthesia, the risk of transmission increases due to the increased amount of aerosols. According to this, preoperative patients who score less than 10 points carry a low risk of transmission, whereas patients who

score more than 10 points carry a high risk of transmission. Furthermore, it is known that droplets stay in the air for 3 hours. If the aforementioned issues about COVID-19 disease antibody screening are taken into account, we think that the test must be done despite false negative results. Preoperative complete blood count, coagulation time, biochemical parameters should also be evaluated. Increased number of leukocytes and neutrophils, decreased levels of lymphocytes and platelets, increased APTT and PT, increased levels of IL 6, procalcitonin, ferritin, D-Dimer and decreased levels of albumin and fibrinogen are among the laboratory findings of COVID-19 disease. Hyponatremia, hypocalcemia, hypokalemia, increased sedimentation, Crp, BUN, creatinine, AST, ALT are biochemical parameters observed for this disease [14, 15]. Even if these blood parameters are not specific to COVID-19, detection of such changes should be a warning for us, surgeons, and should be a warning for the disease. The fact that intraoperative complications increase the duration of the surgery and increase the possibility of bleeding, the increase in the use of physical force and tachypnea of those participating in the surgery are other reasons that increase the risk in terms of contamination. It is recommended in the literature to perform intubation in a negative pressure room and surgical procedure in a positive pressure room especially in orthopedic cases treated under general anesthesia [15, 16]. This practice cannot be carried out in most operating rooms.

In our study, we observed that the cases positive for COVID-19 were more common in surgeries performed in April, when the COVID-19 disease first peaked, and in July and September, when it increased. It is significant that patients who tested positive during this period were in Group 2. When arthroscopy, arthroplasty and oncological surgeries and spine surgery in Group 2 were compared, the highest positivity rate was observed in arthroscopy at 25.3%. This may be due to the insufficient number of patients within the groups. Nevertheless, due to the high positivity rate in the arthroscopy group, we recommend that high-level precautions are taken while performing these surgeries. When the subgroups of the arthroscopy group were examined, it was seen that there was a positivity rate of 29% in the shoulder arthroscopy group. Due to the low number of patients in the hip and ankle arthroscopy groups, these groups were not included in the comparison when comparing the groups. When the knee arthroscopy group was compared with the shoulder arthroscopy group, it was seen that shoulder arthroscopy is more risky, even though the difference is not statistically significant.

In our study, patients who were positive in the first month may have been positive for other reasons. This situation may be due to the patients' failure to comply with their own infection control measures, as well as to the people with whom they had close contact during treatment and the patients' socioeconomic levels. However, the high rate of positivity in the patients in group 2 and its statistical significance are likely to infect the surgeon and other healthcare personnel during or after the surgery of the patients in this group. Another limitation of our study is the verification of the scoring system we determined in repeat cases. For this, advanced studies are needed.

In conclusion, the use of this risk scale and similar ones until we have satisfactory knowledge of COVID-19 and until the pandemic is brought under control, will help us, surgeons, to increase precautions against the risk of infection and hence prevent the use of unnecessary equipment. However, the risks will continue until adequate immunization is achieved in terms of the whole population. It is known that the immunity rate is around 95% at best. Due to the high postoperative positivity rate of Group 2 patients as observed in our study, we recommend taking maximum precautions (n95 mask, face shield etc..) for contamination while performing surgeries in patients with a high surgical score. We believe that routine precautions will be sufficient for Group 1 patients who have a low surgical score.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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